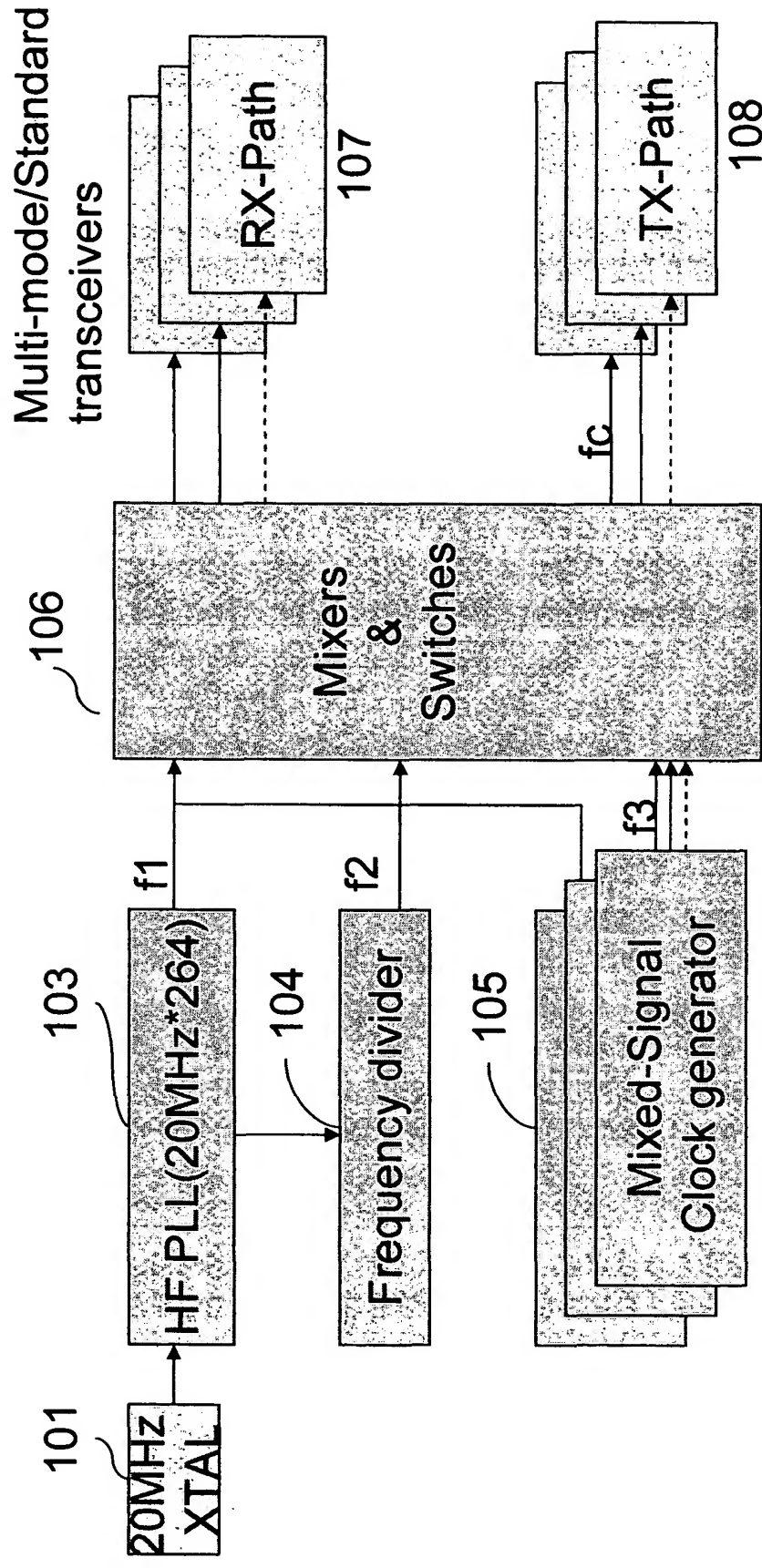
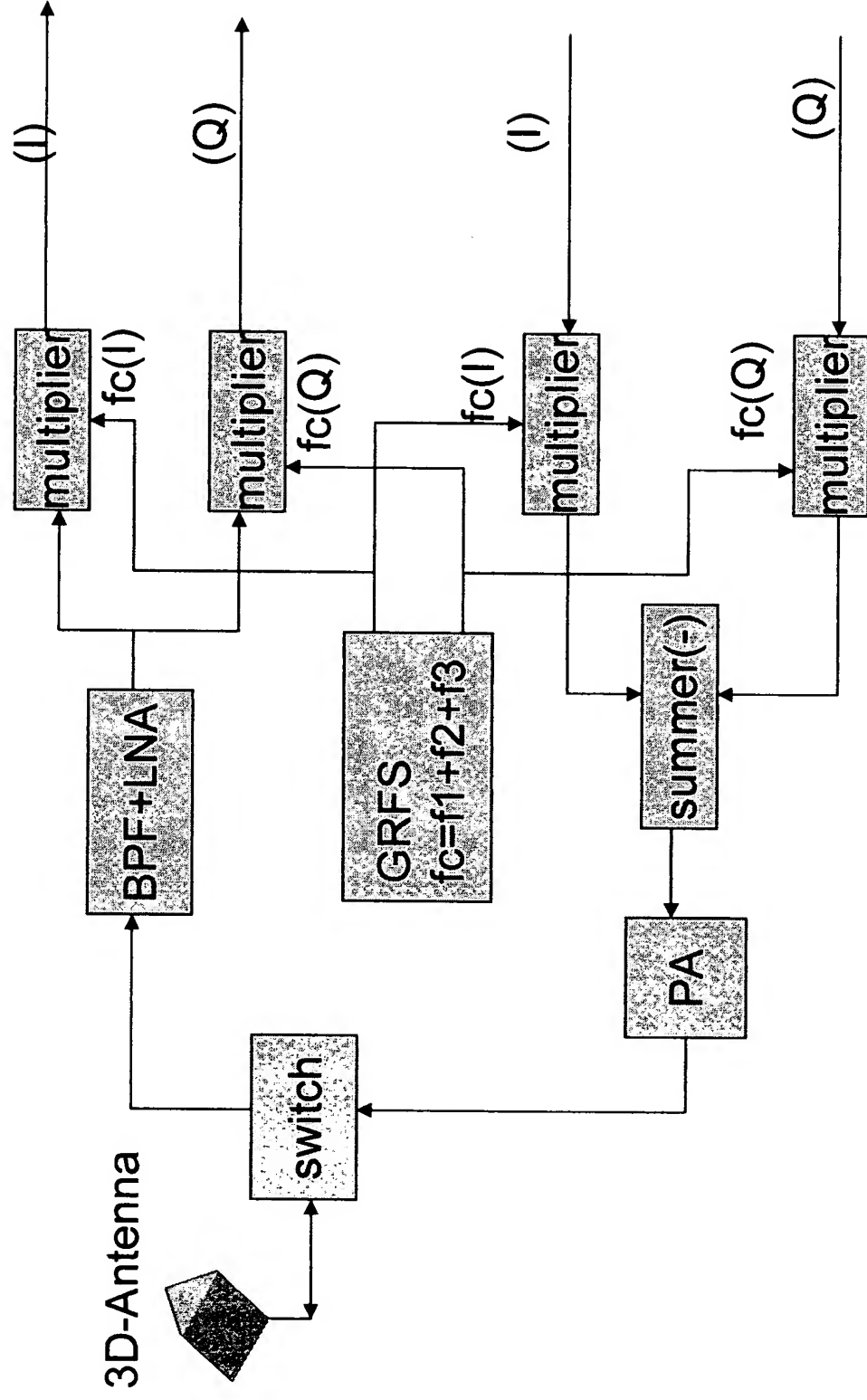


# FIG.1 General Radio Frequency Synthesizer

$$f_c = f_1 + f_2 + f_3$$



# FIG2. Direct Conversion transceiver



# FIG.3 Direct Conversion Transmitter and multi-stage receiver

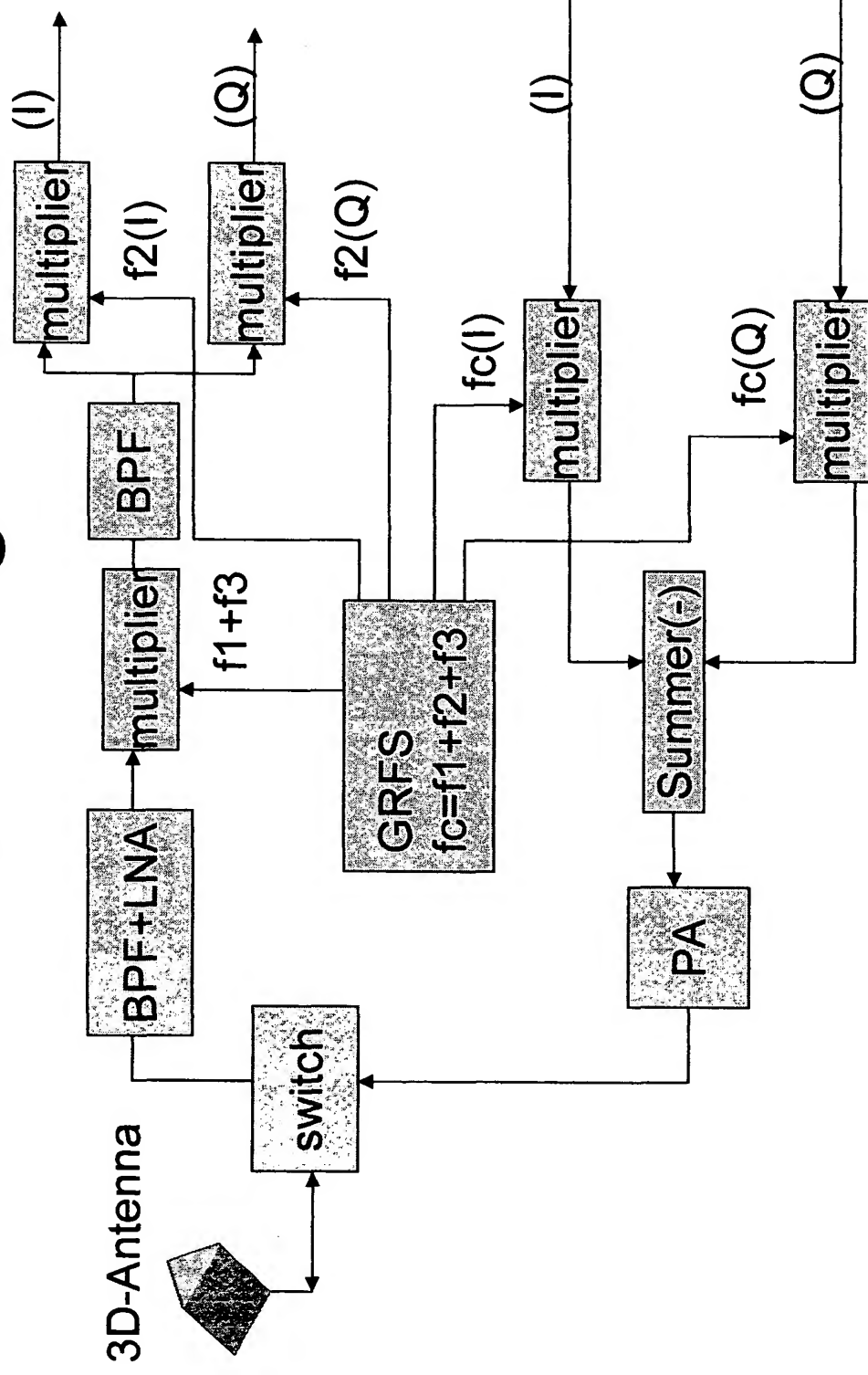
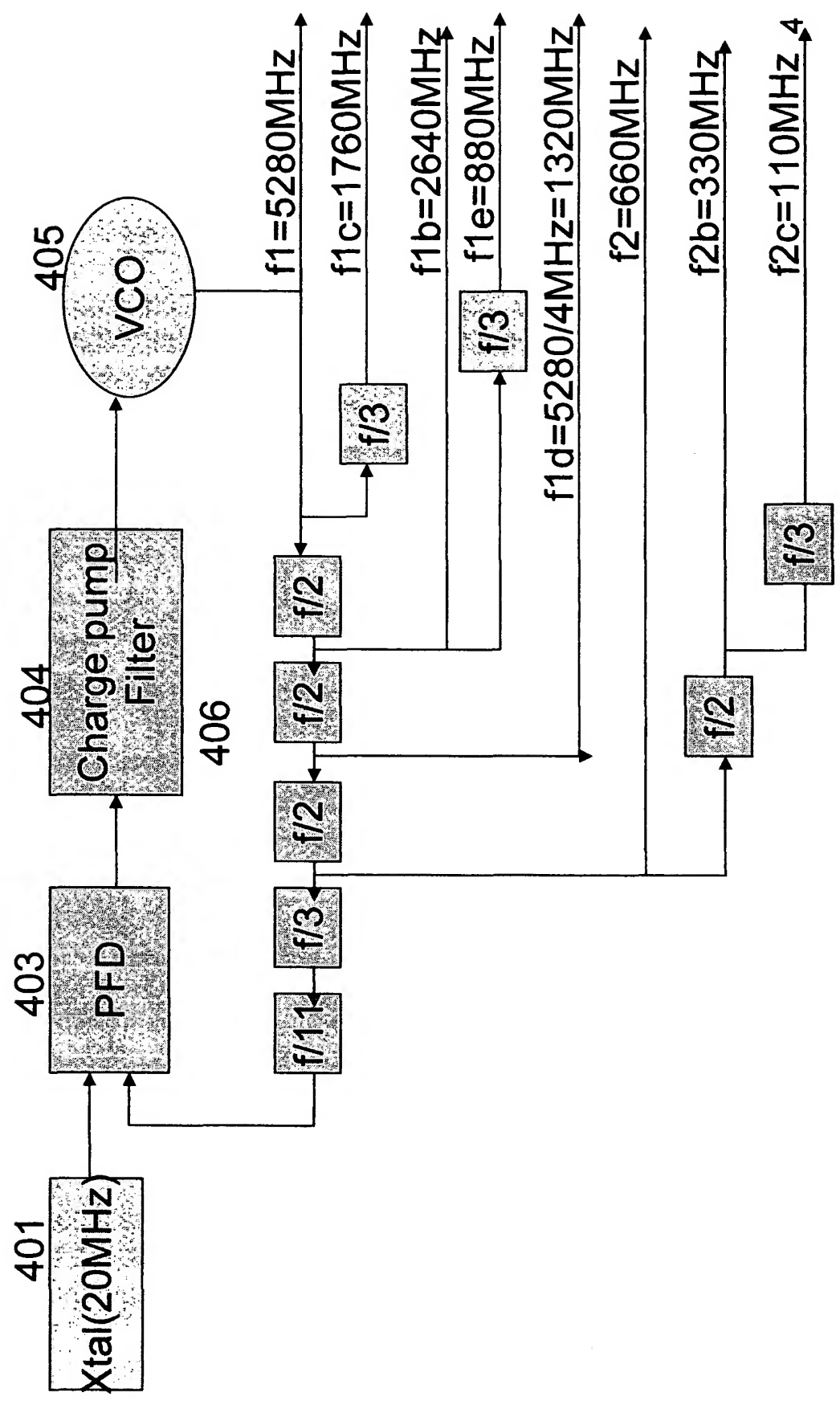
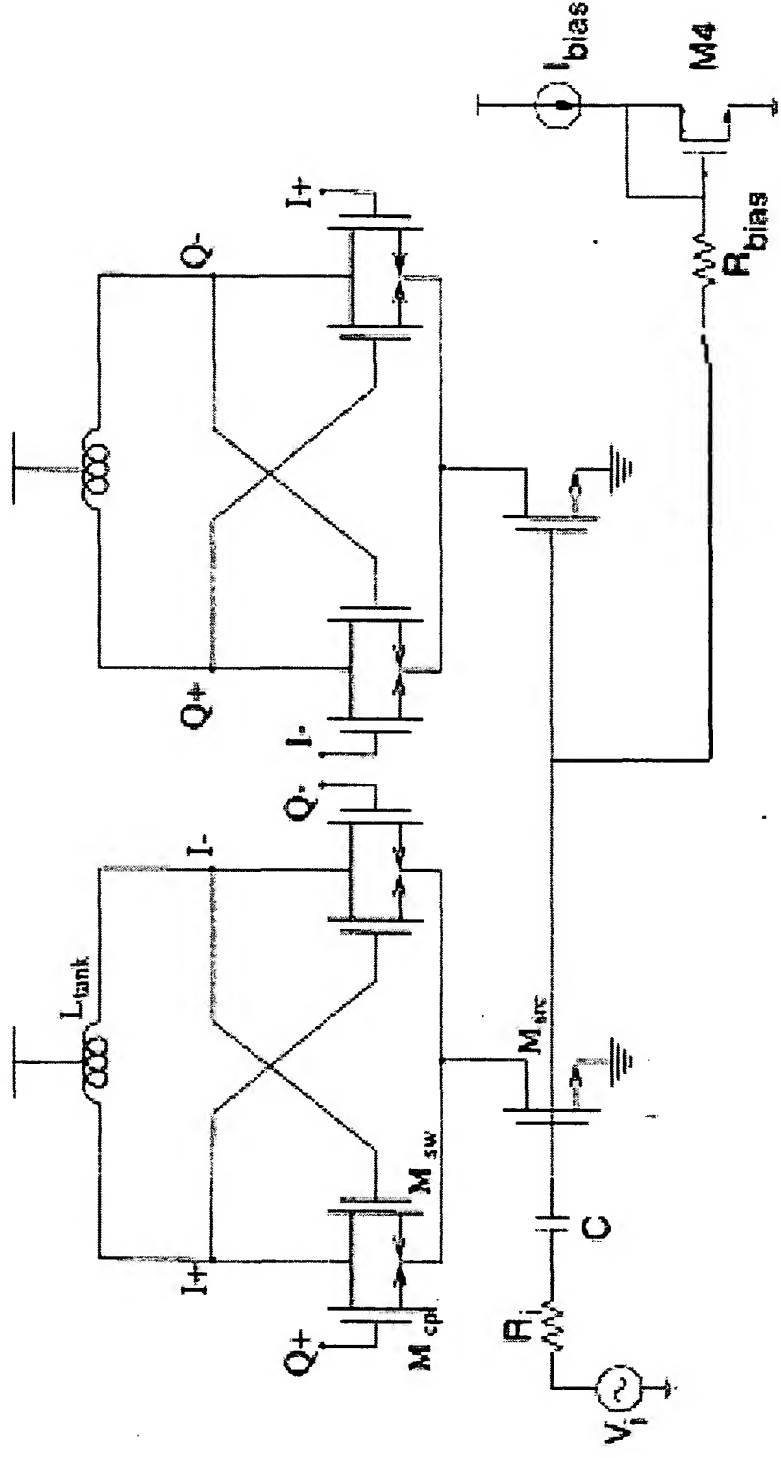


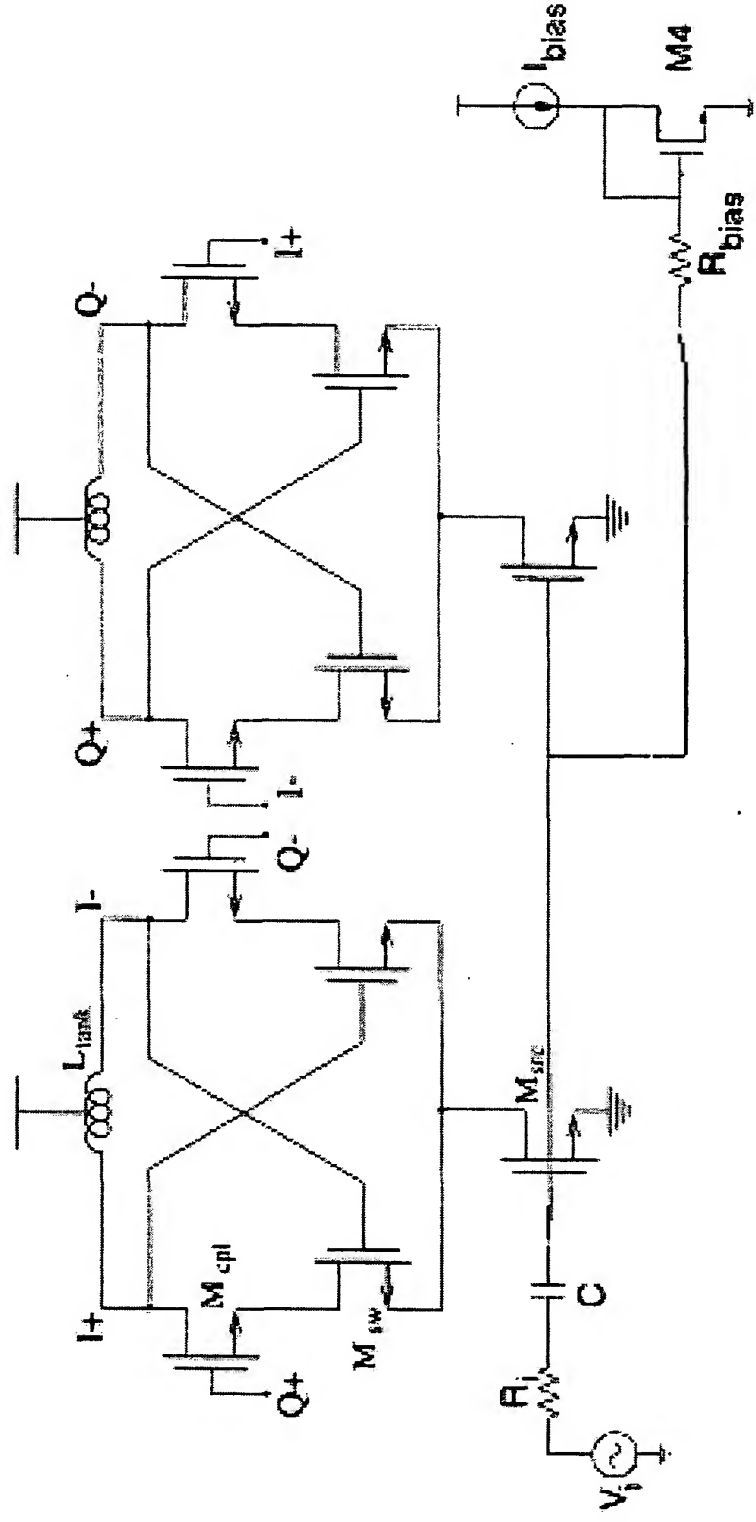
FIG.4 frequency generator PLLs



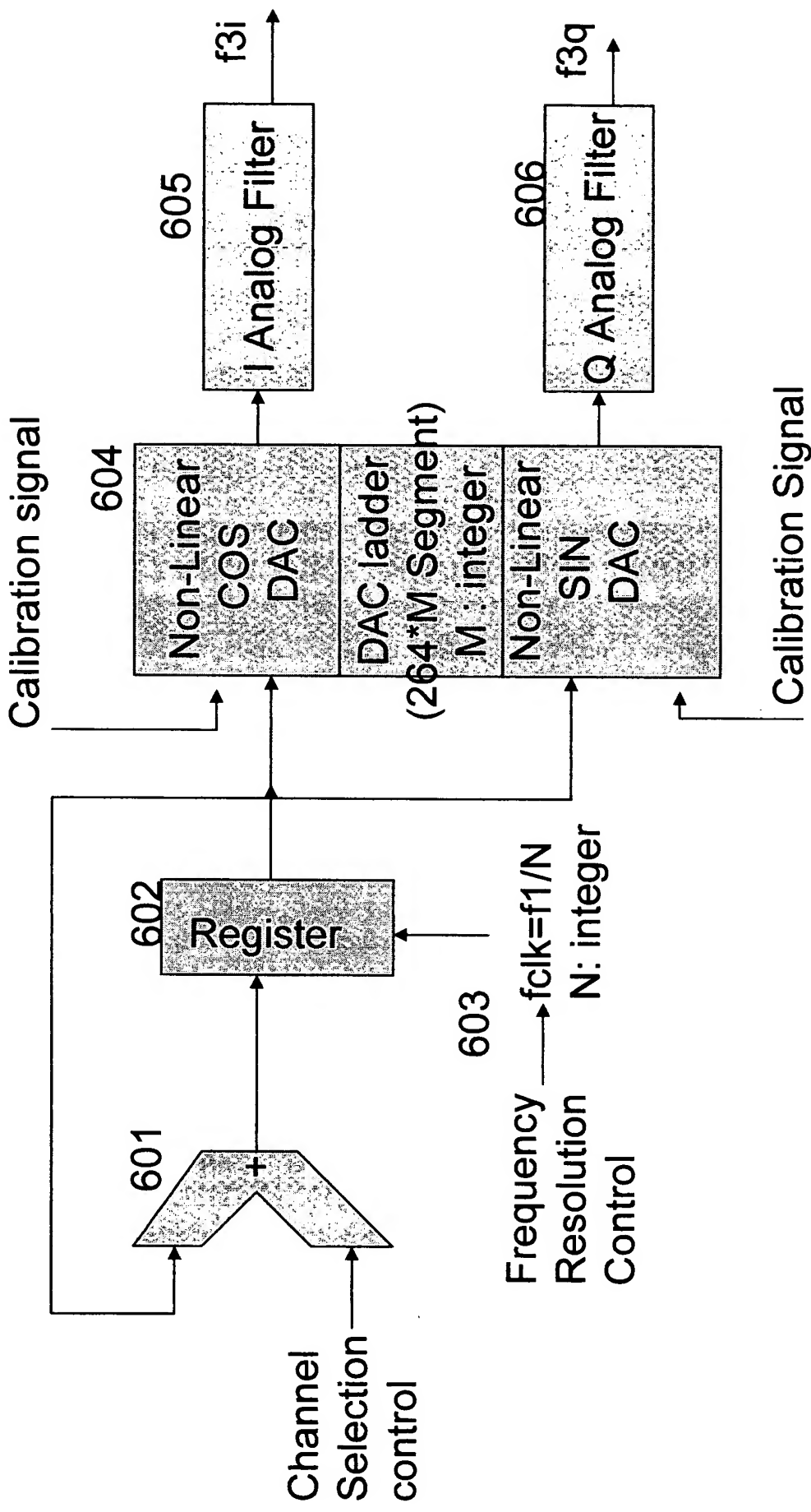
FIGS.5a Superharmonic parallel Quadrature  
injection locked frequency dividers



# FIGS.5b Superharmonic Serial Quadrature Injection-Locked Frequency Divider



# Fig6. Mixed-Signal Clock Generator



# Fig7.Two kinds of three input mixers

mixer: $a*b+c*d$

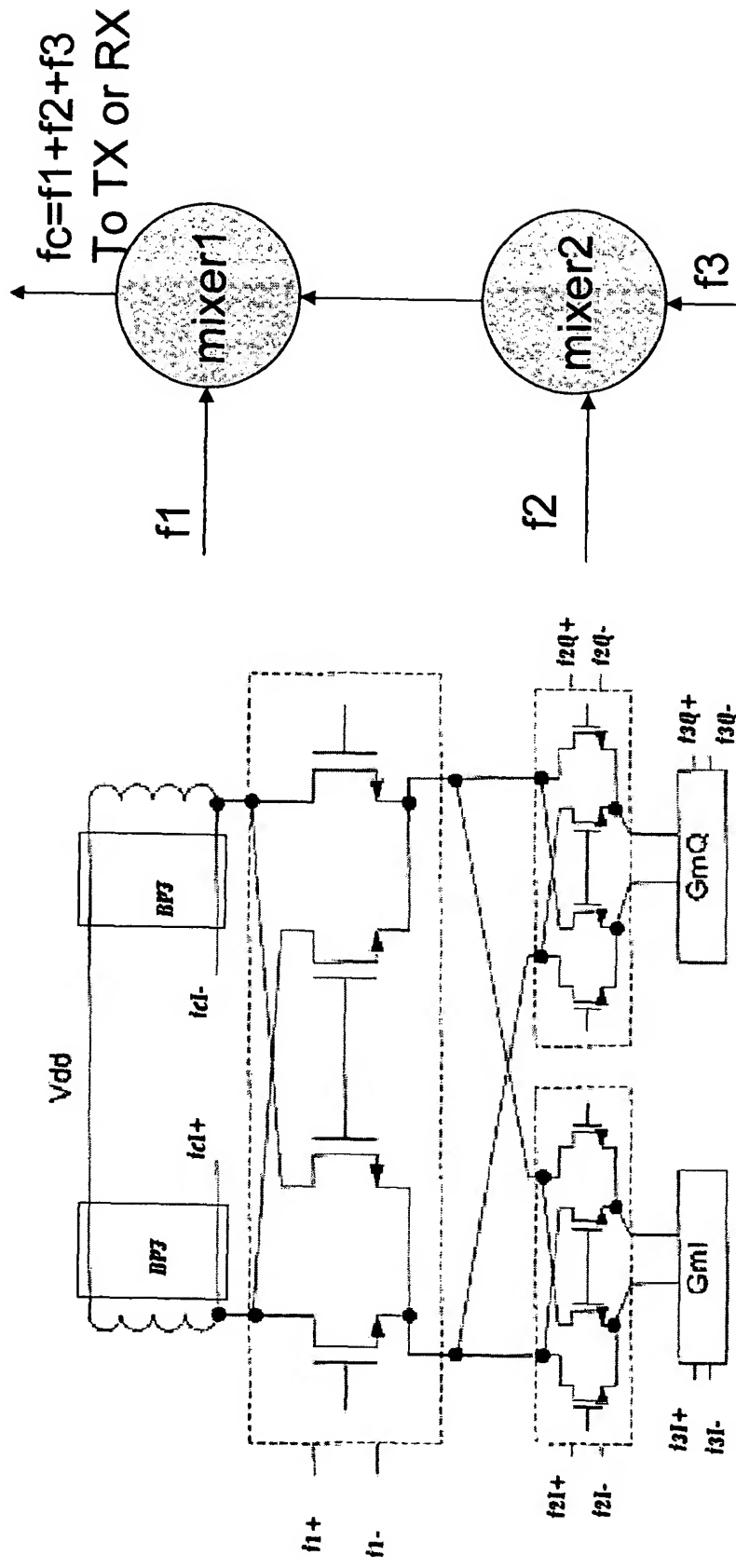




FIG.8 Direct Conversion transceiver IEEE802.11a/b/g

Unit:MHz

11a-low5Gband  $f_c=5180:20:5320$   $f_1=5280$   $f_2=0$   $f_3=-100:20:40$

11a-high5Gband  $f_c=5745:0:5805$   $f_1=5940$   $f_2=0$   $f_3=-195:20:-135$

11b  $f_c=2412:5:2472$   $f_1=2420$   $f_2=0$   $f_3=-8:5:52$

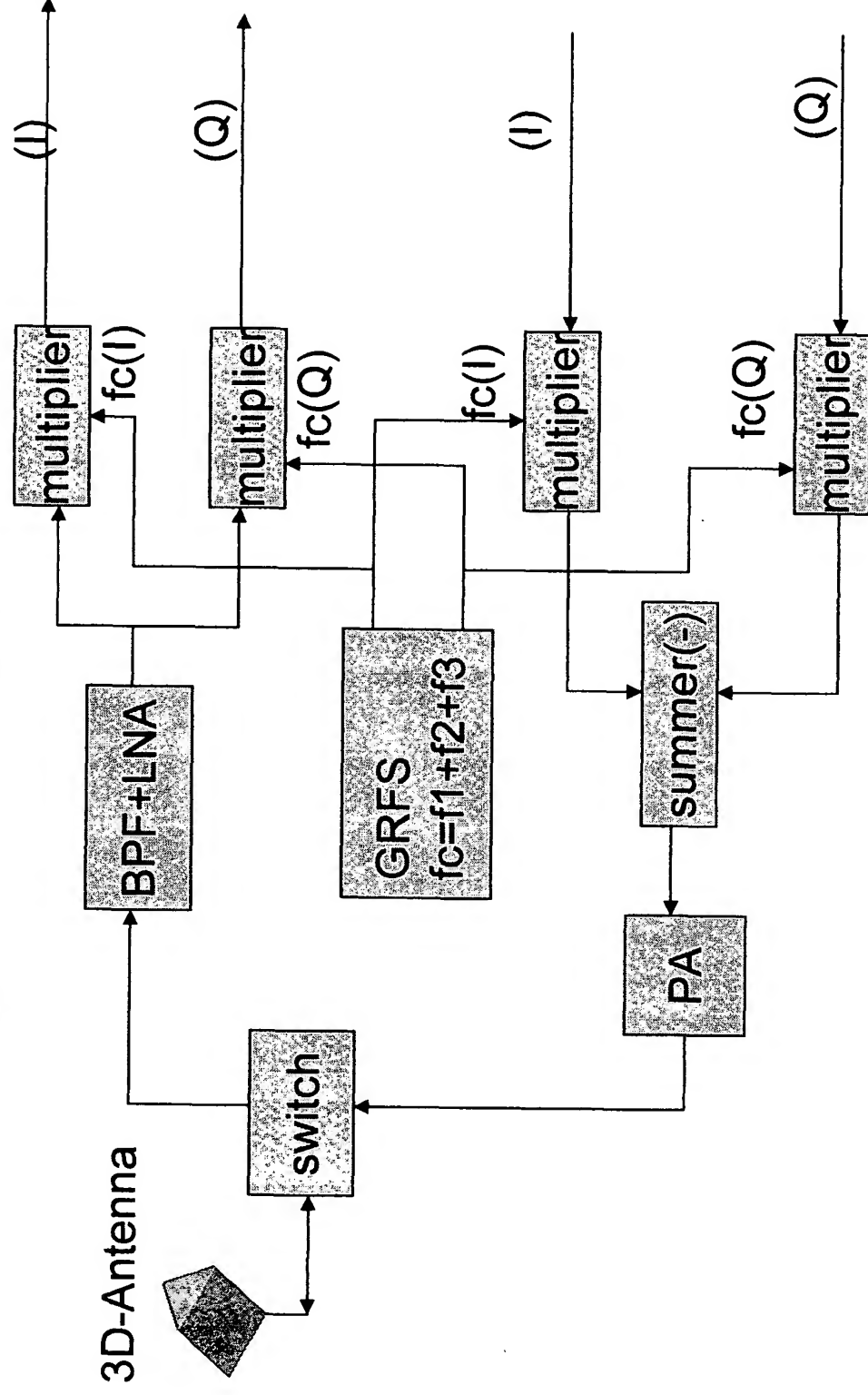


FIG. 9 Direct TX, High-IF RX transceiver IEEE802.11a/b/g

Unit:MHz

11a-low5Gband  $f_c=5180:20:5320$   $f_1=4620$   $f_2=660$   $f_3=-100:20:40$

11a-high5Gband  $f_c=5745:0:5805$   $f_1=6600$   $f_2=-660$   $f_3=-195:20:-135$

11b  $f_c=2412:5:2472$   $f_1=3080$   $f_2=-660$   $f_3=-8:5:52$

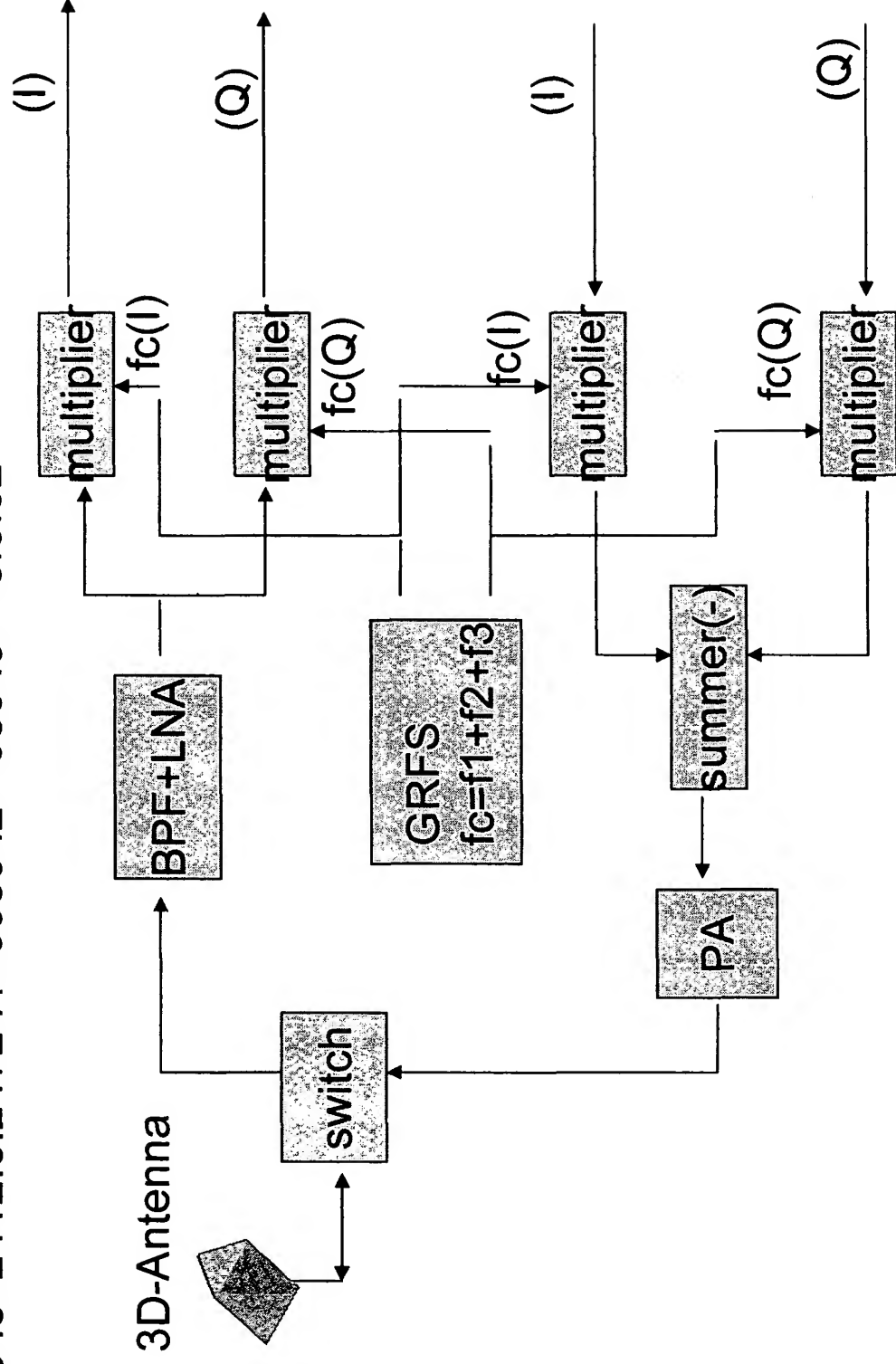


FIG.10 Direct TX Low-IF RX transceiver IEEE802.11a/b/g

Unit:MHz

11a-low5Gband  $f_c=5180:20:5320$   $f_1=5280$   $f_2=20$   $f_3=-80:20:60$   
 11a-high5Gband  $f_c=5745:0:5805$   $f_1=5940$   $f_2=20$   $f_3=-175:20:-115$   
 11b  $f_c=2412:5:2472$   $f_1=2420$   $f_2=22$   $f_3=-30:5:30$

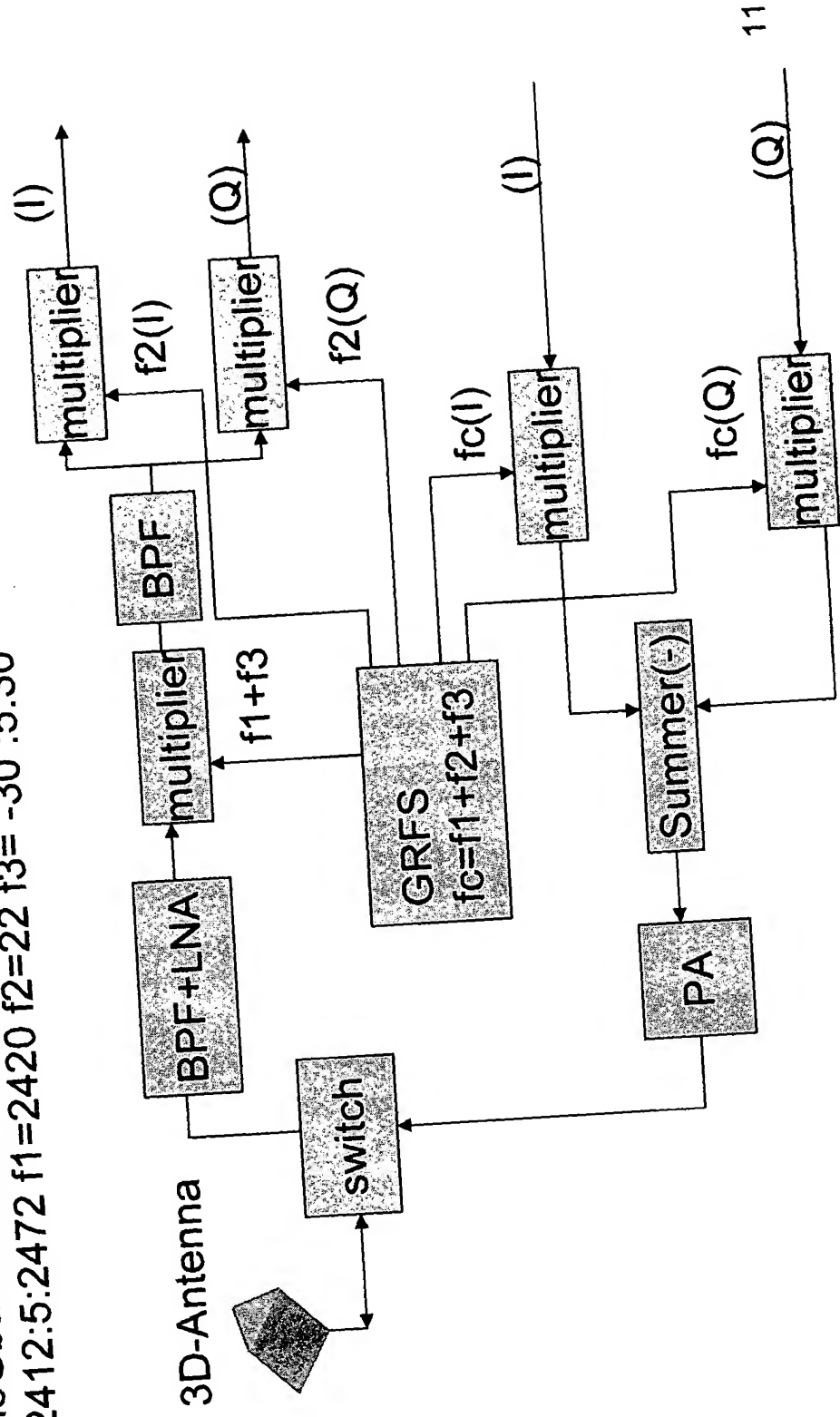


FIG.11 Multi-port design example

